

Long Bo for LAPD

Hans Jostlein

10/20/2011

What is it ?

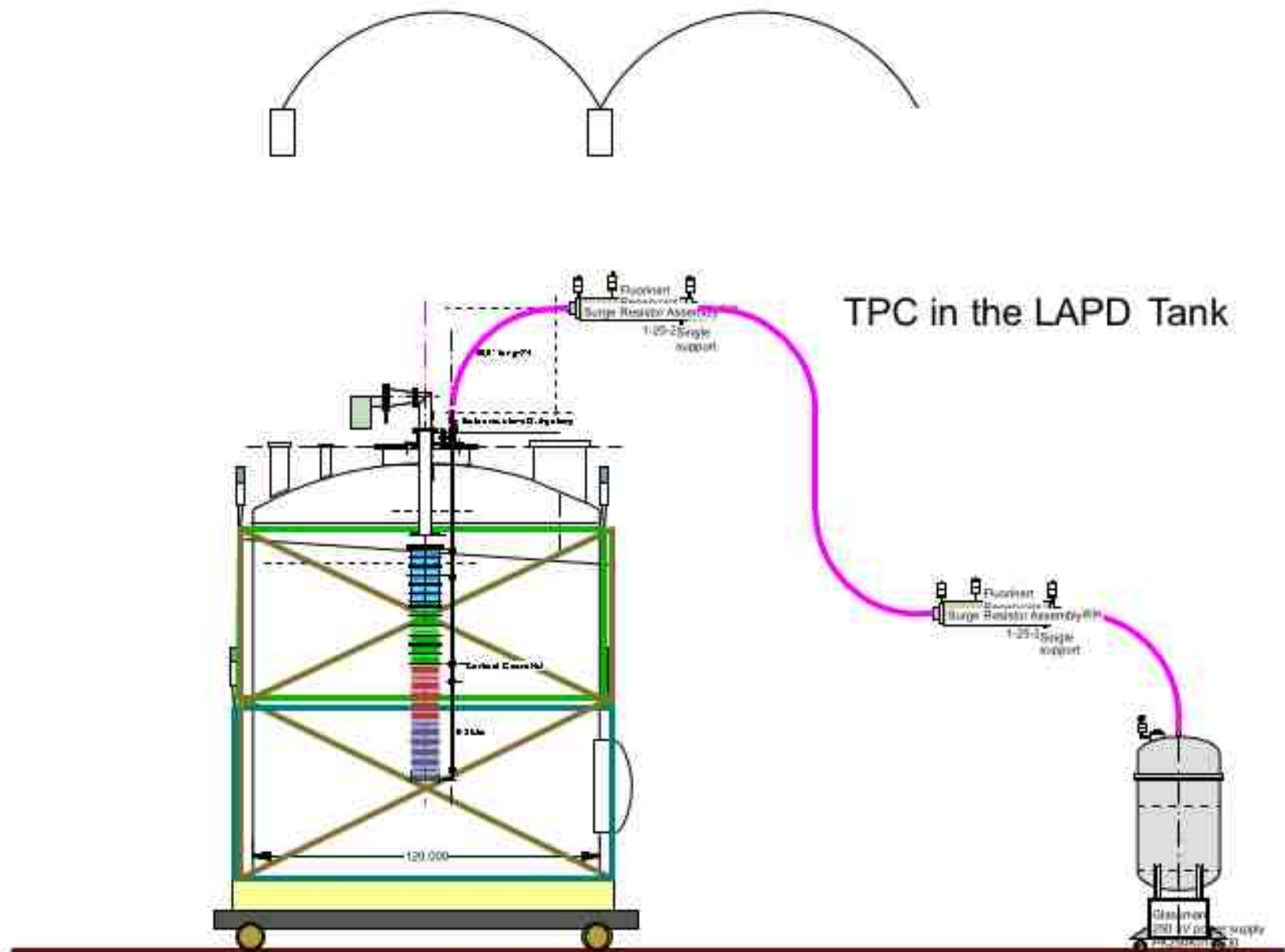
Purpose

- Demonstrate a working TPC with long drift in LAPD
- Demonstrate a working HV system
- Demonstrate low noise

What is it ?

List of Items:

- Use the original Bo chamber, including electronics
- Extend it to 2 m length (from 0,5 m) by adding
3 drift cage cylinders
- Make a new HV feedthrough, cable type, which will also validate this design for MicroBooNE and lbne
- Build a trigger system from 16 scintillation counters
- Option: add a photocathode and 3 fibers to get signals from the full drift length
- Option: Add a 10 m long wire (folded) with a single channel pre-amp to measure noise, with and without using a noise antenna

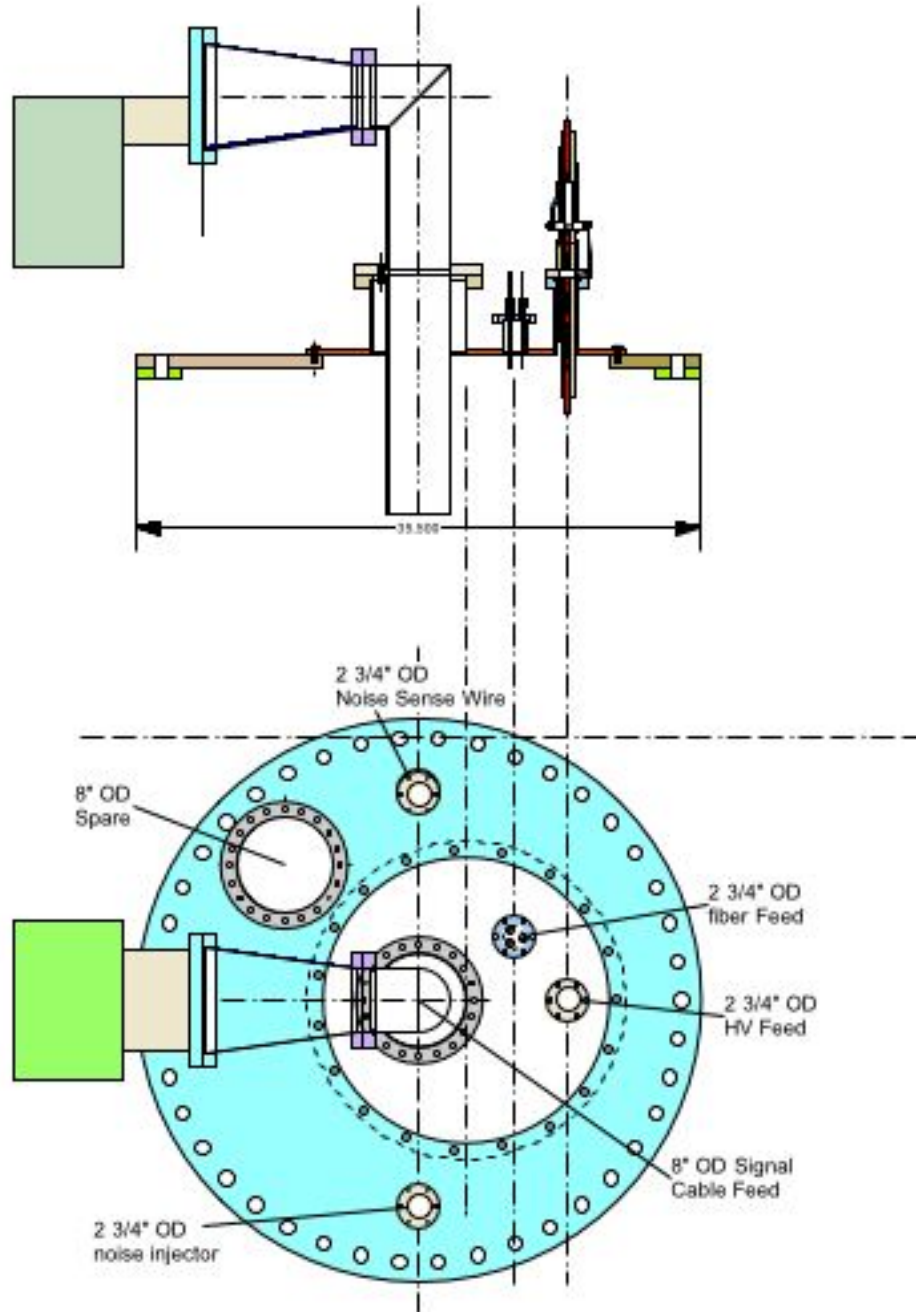


Installation

Flange Scheme

The existing large top flange (35 ½” diameter x ¾ “ thick) will be removed and replaced with a similar flange, which has a 18” diameter hole, surrounded by a tapped hole circle to hold a 20” diameter sub-flange.

This is to make the Long Bo assembly smaller and much lighter



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The Long Bo Assembly

The Long Bo Assembly comes in two parts, to ease transportation:

Top Assembly:

A top (20 inch sub-) flange which holds:

- The existing Bo TPC with amplifier boards, minus its cathode and one field cage extension
- The Chamber signal cable tube
- the HV feedthrough
- The fiber feedthrough

(The 3ft flange holds flanges for:

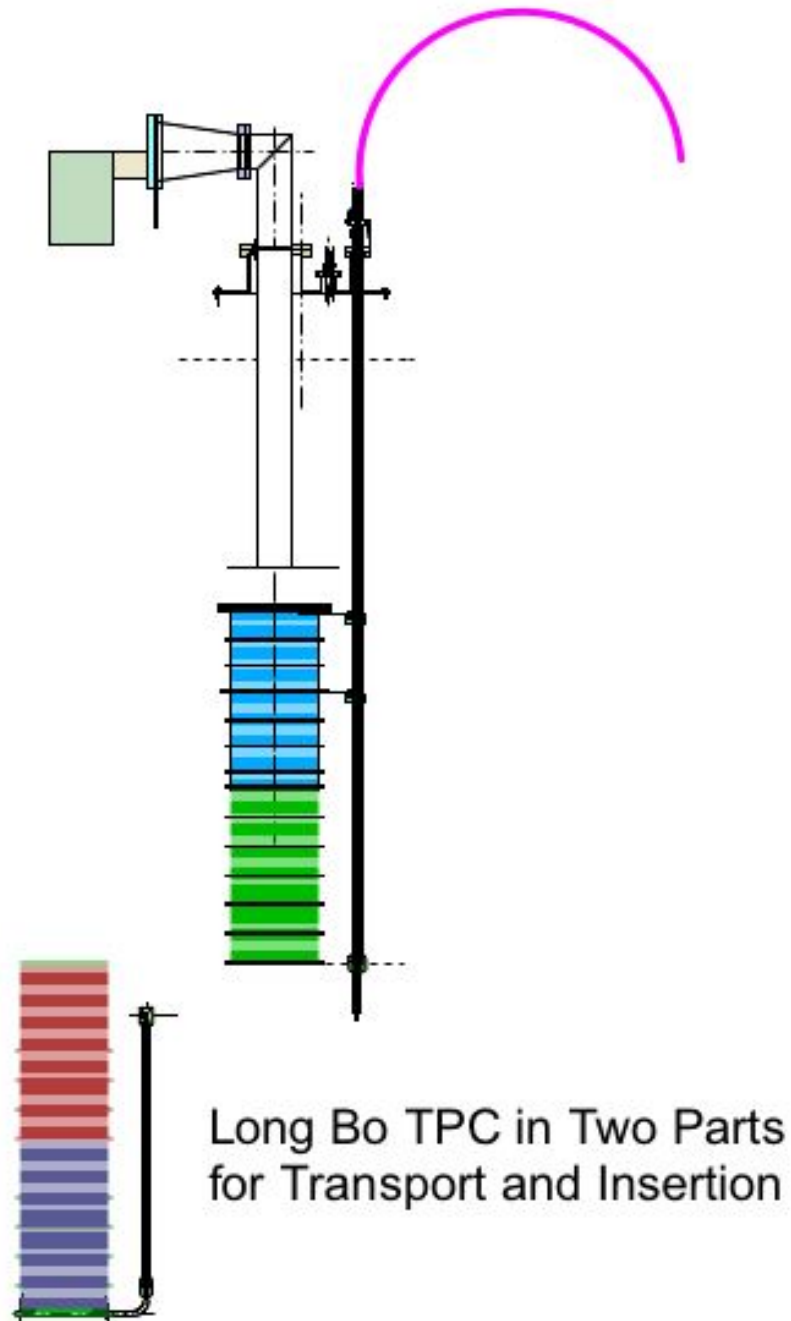
- the single channel noise sensing antenna wire
- a noise injection antenna)
- A spare 8" OD CF flange

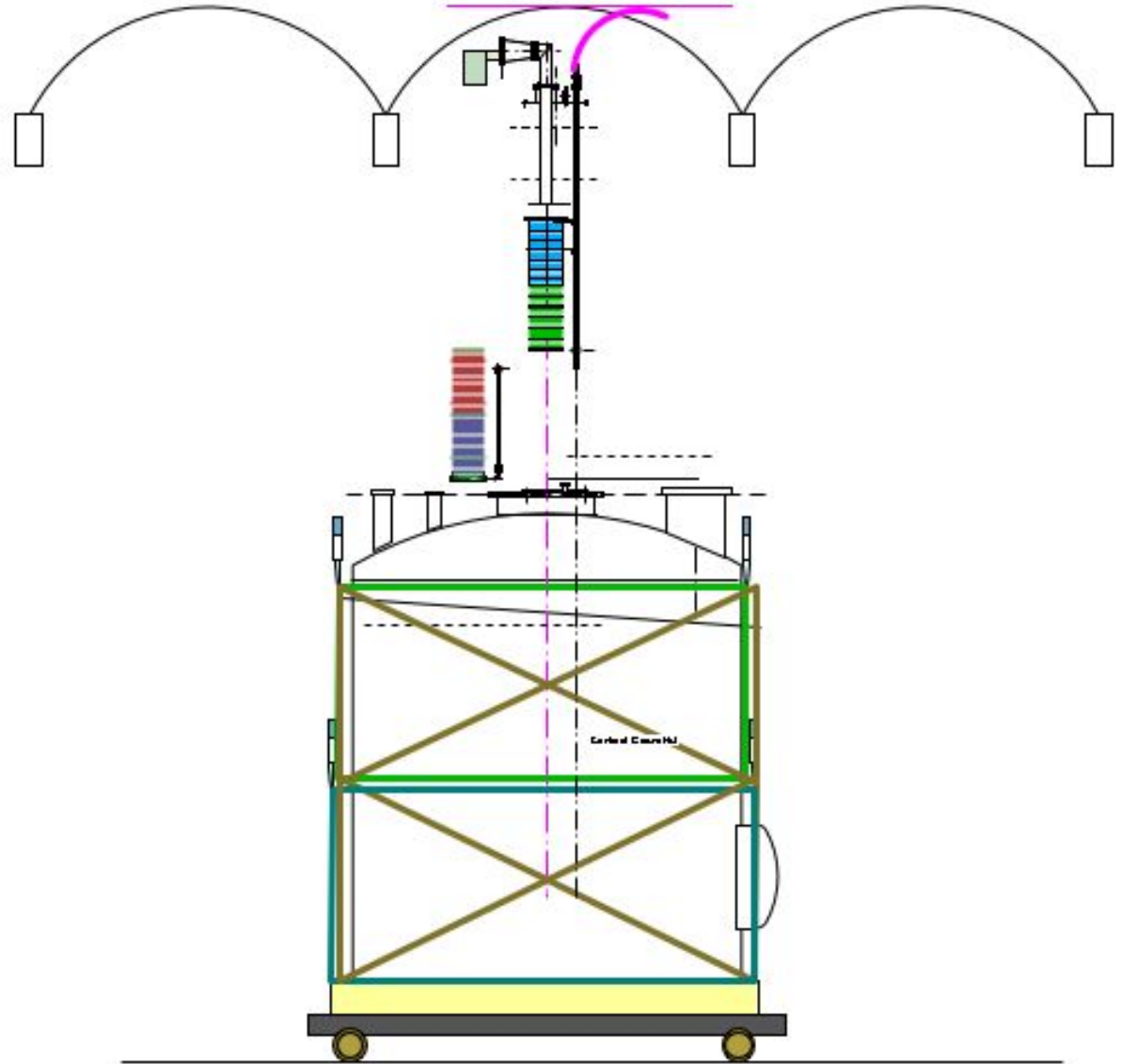
The Long Bo Assembly

The Long Bo Assembly comes in two parts, to ease transportation:

Bottom Assembly consist of:

- The bottom two field cage extension cylinders, with the original cathode installed
- The cathode with its photocathode and fiber holders
- The lower half of the HV feedthrough
- The PEEK fiber tubes, which are looped and will be fed through their feed through flange after the two halves of the TPC are connected.





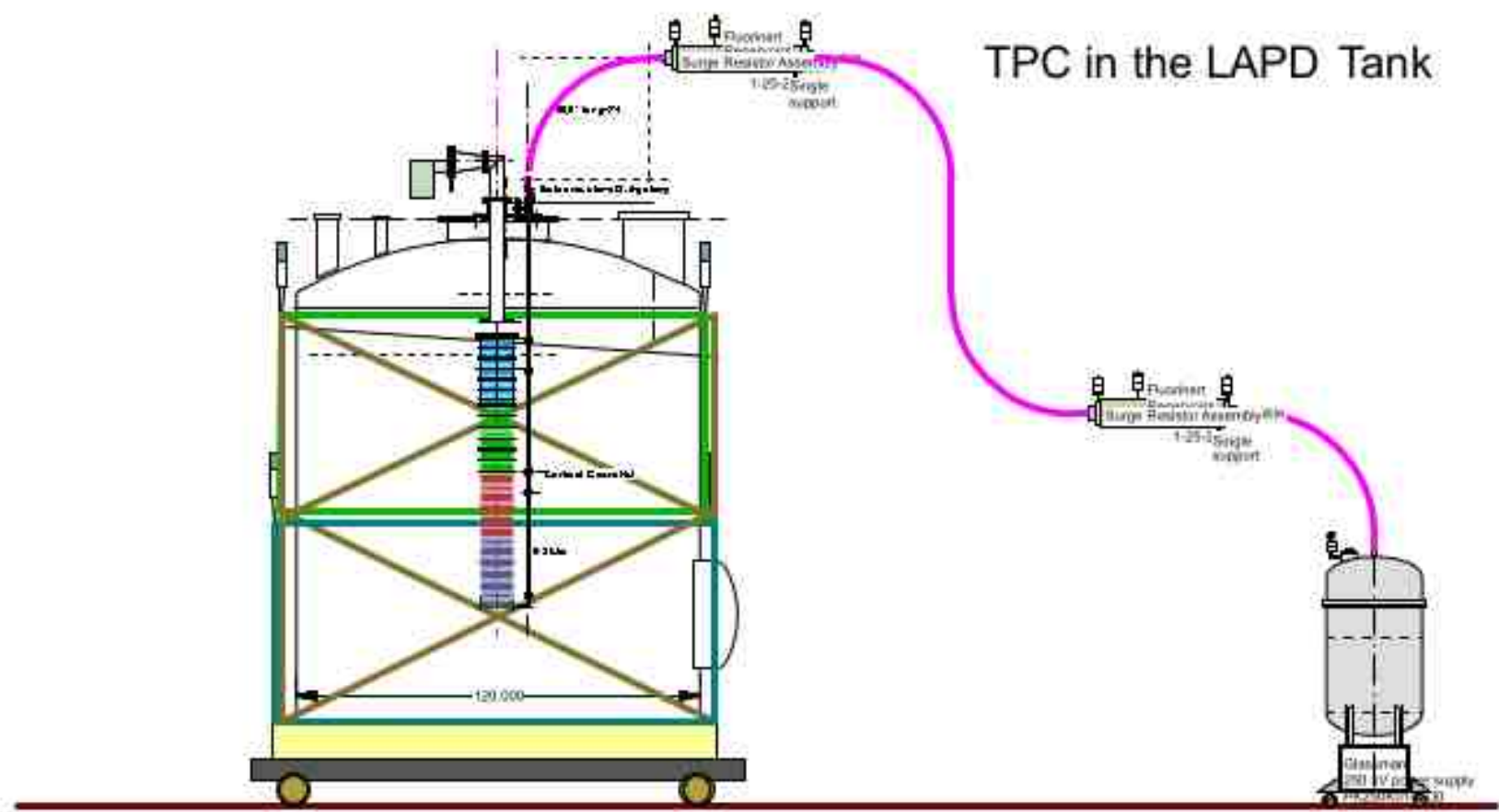
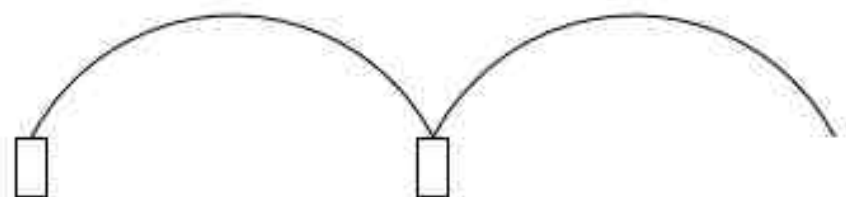
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Modifications to Bo

- Make a new 35 ½” flange
- Make the sub flange with its own sub-flanges
- Make 3 field cage extension cylinders
- Make a longer cable shield tube
- Make longer signal cables
- Remove the cathode assembly
- Install a photo cathode and fiber holders on the cathode and bottom field cage section.
- Make a new HV system:

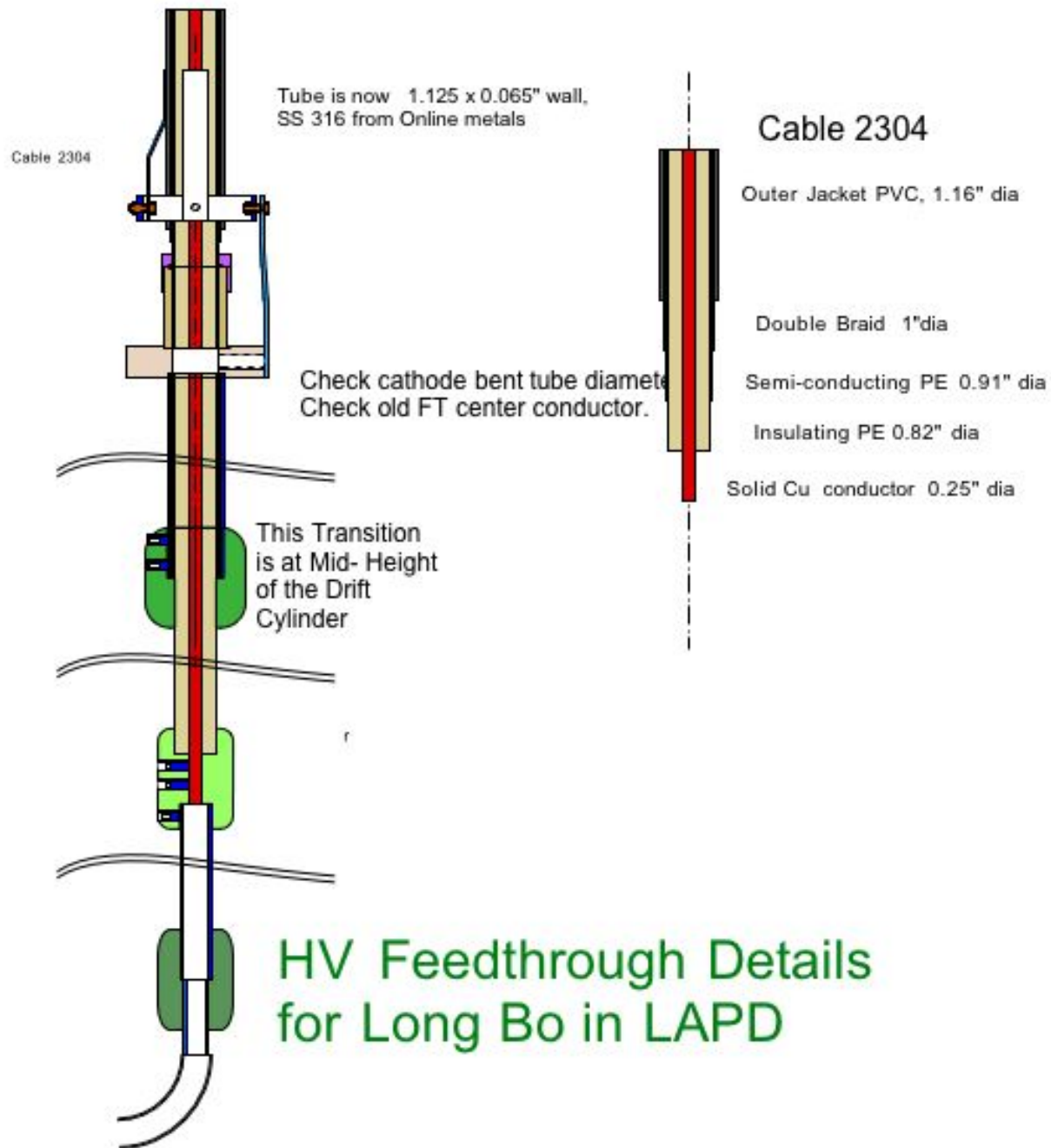
Modifications to the HV System

- Make a new HV Feedthrough, cable-based
- Adapt the TPC mounting clamps to the new FT
- Insert transition pieces to provide a break at half-height and adapt the bottom end of the HV supply to the cathode connection
- Obtain and adapt two “surge resistor boxes” from Jim Walton, as parts of the HV noise filter
- Use the Tevatron 250 kV Glassman supply
- Buy more HV cable to reach the ground where the HV supply will be



TPC in the LAPD Tank

Hans Jochheim
10/18/2019



The Light Pulse System

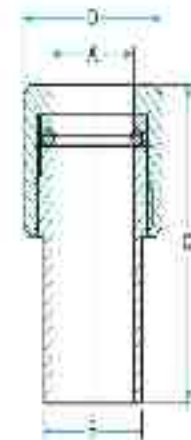
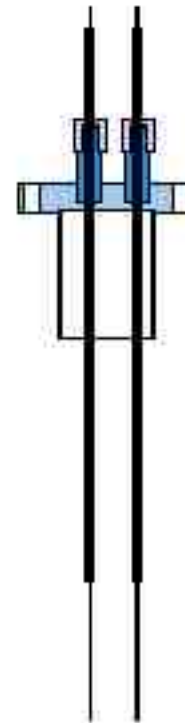
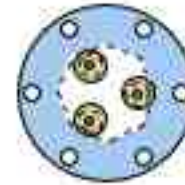
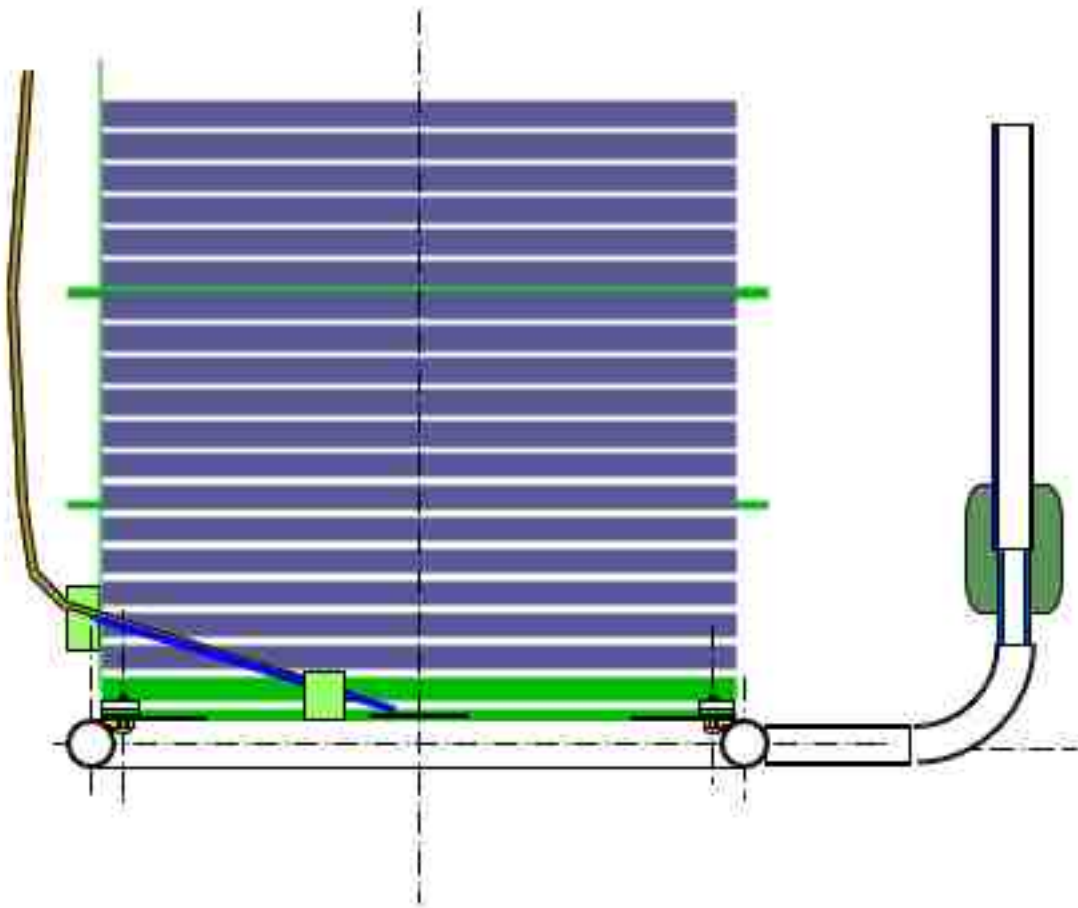
It will be useful to be able to detect electrons from a photo cathode mounted on the inside of the cathode mesh:

- We can test the complete system without waiting for cosmic rays
- Do precision studies of drift time versus HV
- Get electron loss data versus drift time from the same studies

The Light Pulse System Design

- We will use three fibers, each in its own PEEK capillary (1/8" OD x 1/16" ID)
- The capillaries have sufficient stiffness to protect the fibers
- The capillaries and fibers are continuous from the flash lamp to the photocathode
- The capillaries are sealed at the flange using commercial quick-disconnects (see next slide)
- The capillaries are purged on the inside continuously by a tiny Ar gas flow
- The fibers are loose in their capillary and can accommodate thermal shrinkage and motion
- The capillaries and fibers make a flexible connection to the light flasher, located close to the flange

Light Fiber Details



Noise on Long Wires

Along with the Long Bo TPC test in LAPD, it may be interesting to measure noise on a long (maybe 10 m long, folded) wire in LAPD. Bo has very short wires and may not be a noise good model for lbne or MicroBooNE.

One would mount a wire of length 2.5 m x 4 times on a G10 tube off the 35 ½" flange. The same flange would hold the connector(s) and, possibly, the warm or cold single channel amplifier.

The measurements could be done with a spectrum analyzer if we get enough gain in a pre-amplifier (warm or cold). I am guessing here, but we'll need between 1000 x and a million x current gain. I am sure Dan Edmunds will have a more accurate idea.

A second (conducting) rod could be mounted on a separate flange and would be driven with fixed frequencies or white noise to make a separate sensitivity check.

TPC insertion while LAPD has LAr?

The boil-off will protect the purity of the LAr while the flanges are changed

- First remove the large flange and replace it with the modified one
- Bring the upper half of the TPC assembly to the platform and suspend it
- Attach the lower half
- Remove the small (20") blank sub flange
- Install the TPC assembly:

Supplied Air Suit



